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daffodil bulbs and as many crocuses. The last are scattered at irregular intervals around the schoolhouse in the newly seeded lawn.

7. For the ensuing month the work will pursue much the same course. Additional records will be developed and results will be tabulated for further study.

FIELD WORK.

IRA B. MEYERS.

ANIMAL LIFE.

(For "Plant Life" see COURSE OF STUDY, Vol. II, No. 2.)

THE various forms of animal life of a region are as closely associated, in their habits and distribution, with the topographic features of the area they occupy as is the plant life. Lake, shore, marsh, stream, prairie, and woodland each has its particular animal society wholly characteristic, in its physiognomy, habits, and distribution, of the area it occupies.

In any area the factors most influencing plant structure, distribution, and habit are moisture, soil, light, exposure to winds, and surrounding plants — factors relating to nutrition and protection. In like manner, the conditions most influencing animal structure, habit, and distribution are those relating to food (its nature and location) and protection (against other animals and climatic changes). A seemingly slight change in the nature of the environment may have a determining influence on the character of the animal life: in a pond, the animals living in the water body and feeding upon floating food differ in physiognomy and habit from the life confined to the muck and ooze of the bottom; and both groups differ from the surface striders or swimmers. Equally characteristic of the area are the air-breathers — birds and mammals — according to their station or the section they patrol, whether running along the shore, wading along the water margin, swimming and diving, or flying over the water surface. Fully as characteristic are the animals located in the various environment aspects of mountain, prairie, and woodland.

Field work should afford students the opportunity of becoming acquainted with the living forms on various topographic areas, and of knowing something of their structures and habits as related to their conditions of life. Great variety in animal forms indicate a great number of conditions for living; every aspect that meets the needs for living is occupied by its peculiar group. The correct interpretation of structure and habit is dependent upon a knowledge of function. Cages and aquaria may be made invaluable aids in the study of animals, by placing the forms under conditions as near like their habitat as possible. The environment of all forms of life caught in the field should be closely observed, and the necessary material collected for making them a comfortable home in the cage or aquaria.

DIRECTIONS FOR STUDY.

Use topographic map as suggested under "Plant Life." Make a list of the animals associated with each topographic feature—birds, reptiles, batrachians, etc. Show, by coloring your map, the particular part of the area they occupy. What particular feature has been most prominent in attracting each group to the area? Are any of the animals restricted to a particular aspect of the area? Are any unrestricted in range? Are any of the animals dependent upon a particular area for food, but able to pass from one area to a similar area some distance away; for example, from one pond or stream to another? Do any of the forms change their habitat or food at different stages in their development? Try to discover their homes, their methods of hiding and caring for their young; where and how they spend the winter.

REFERENCES.—Jordan, *Animal Life;* Thomson, *The Study of Animal Life;* Burroughs, *Squirrels and Other Fur-Bearers;* Weed, *Nature Biographies.*

NORTH SHORE AREA.

A STUDY OF A RAVINE AREA.

Topography (see geography outline).

NOTE.—The shores of Lake Michigan, north of Chicago, are cut by numerous ravines, the drainage courses through which the waters of this border area are carried to the lake. These ravines may be seen in all stages of development, from a shallow gully of a steep bluff to a mature ravine with a permanent stream. The area affords exceptional advantages for a study of the successive stages in the development of the topography and life of a stream valley.

DIRECTIONS FOR STUDY—PLANT AND ANIMAL LIFE.

Note the prominent topographic features *en route* from Chicago to the area studied; the characteristic plant life as related to the ridge, swamp, meadow, and ravine topography; animal life of the area traversed (wild and domestic).

I. *Head of Pettibone Creek.*—(This area was chosen on account of a few special features. The ravines of Lakeside, Glencoe, and Ravinia are equally instructive.)

1. Detailed topography of the area above the head of the ravine. (*a*) The dominant plants of this border area; their soil and moisture conditions—at time of observation, at beginning of growing season. What visible influence has variation in moisture conditions upon the plants of this area?

2. Forms of animal life common to this border area; those actually seen; those not seen, but their presence indicated by tracks, burrows, or nests. The special features—food, water, homes, hiding places—attracting the various animals to the area. Do these animals spend the entire year in this area? The food of these animals; their method of locating and prehending it. Is their food available during the entire year?

II. *Area between ravine head and intermittent spring area.*

1. Observe the exact changes that occur in the back area as the head of the ravine advances inland; in topography; in plant species; in luxuriance of plant growth; in evenness of distribution in the area. What factors, influencing plant growth, are modified by this change from a level to a ravine topography? Are the conditions more favorable to plants in one part of the ravine than in another? Consider direction of slope, steepness, base, and top.

2. Has the change to a ravine topography been favorable to any animals not found in the border area? Has it been unfavorable to any animals of the border area?

III. *Spring to permanent stream.*

1. Most noticeable influence of springs on topography, plant life, animal life. Plants found in this area and not common to any of the previous areas. Plants of this area common to former areas. What change in conditions has favored new plants? Do the conditions in any part of this area exclude plants found in the areas above this point? What influence has alternate flooding and drying upon the plant and animal life? Are any of the plants confined to a particular aspect of the area; around head of spring, in marsh below the spring, base of slope, top of slope?

2. Animal life found in the spring; forms living on the water surface or swimming through the water; those living on the bottom. Animals living in the marsh below the spring; those confined to the water; those alternating in and out of water; those reaching water by burrowing. The method of locomotion of these various animals; their probable way of entrance to the area; the nature of their food. (Secure living specimens for aquaria and cage study.)

IV. *Permanent stream area.*

1. Consider the various ways in which the stream has developed its topography; the plant life associated with each topographic feature at different stages of development. (*a*) Bare bluffs, caused by land slides on account

of basal erosion; plants first gaining foothold on this bared area; plants that succeed each other until the area reaches its highest stage of plant development. What changes in growth conditions occur at each progressive stage? Observe the use made of these bluffs by animal life. (*b*) Deposition of sediment forming a mixed clay, sand, and gravel flood plain; plants gaining a foothold on this area; succeeding plants, until the area reaches its highest stage of plant development. Compare with plant development of bluff. What factors of growth most influence the plants of the flood-plain area? Are these alluvial deposits used as feeding grounds, nesting places, or resting places by animals? (*c*) Lagoon from a deserted stream bed or cut-off: Plants first entering this area; compare with plants along the flowing stream; succession of plants in the dying out of the lagoon. Probable way in which these new plants find their way into the area? Animal life common to the lagoons; compare with permanent stream life; with the spring life. In what respects do conditions for living differ? Do the animals show any corresponding variation in habit or structure? Consider influence of current; gravelly or muck bottom; stagnant water; enemies.

V. *Stream mouth and lower flood plain area.*—(Stream bed cut to lake level; current stagnant one-fourth mile inland; wide flood plain.) Plants in the stream not found in the upper areas; floating, or rooted on the stream bottom. Compare the plants found on this level flood plain with the plants of the level area at the ravine head. In what respects do growth conditions differ? Be on the alert for indications of animals; look for tracks in the soft banks along the stream; explore the thickets for birds. Are the conditions more favorable to animals here than in the upper valley?

REFERENCES.—Salisbury and Alden, *Geography of Chicago and Environs;* Cowels, *The Plant Societies of Chicago and Vicinity;* Jordan, *Animal Life;* Furneaux, *Life in Ponds and Streams;* Gaye, *The Great World Farm.*

GEOGRAPHY.

ZONIA BABER.

OUTLINE FOR ELEMENTARY SCHOOL.

MOTIVE is the power which moves us on to definite ends. When we examine the motives that lead our pupils to accomplish their daily school work, we find results which are too often not flattering to our educational aspirations. The desire to please the teacher or parent, to receive certain credits, or to move into the next grade is the usual incentive which leads the pupils through tasks which have no appeal for them as